



Cornell
University

ANNOUNCEMENTS

Graduate School of
Nutrition

1968-69

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Nutrition

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The Graduate School of Nutrition, a unit of Cornell University, is supported in part by state appropriations through the State University of New York

Academic Calendar

	1968-69	1969-70
Registration, new students	F, Sept. 13	F, Sept. 12
Registration, old students	S, Sept. 14	S, Sept. 13
Fall term instruction begins, 7:30 A.M.	M, Sept. 16	M, Sept. 15
Midterm grade reports due	S, Oct. 26	S, Oct. 25
Thanksgiving recess:		
Instruction suspended, 1:10 P.M.	W, Nov. 27	W, Nov. 26
Instruction resumed, 7:30 A.M.	M, Dec. 2	M, Dec. 1
Fall term instruction ends, 1:10 P.M.	S, Dec. 21	S, Dec. 20
Christmas recess:		
Independent study period begins	M, Jan. 6	M, Jan. 5
Final examinations begin	M, Jan. 13	M, Jan. 12
Final examinations end	T, Jan. 21	T, Jan. 20
Intersession begins	W, Jan. 22	W, Jan. 21
Registration, new students	F, Jan. 31	F, Jan. 30
Registration, old students	S, Feb. 1	S, Jan. 31
Spring term instruction begins, 7:30 A.M.	M, Feb. 3	M, Feb. 2
Deadline: changed or make-up grades	M, Feb. 10	M, Feb. 9
Midterm grade reports due	S, Mar. 15	S, Mar. 14
Spring recess:		
Instruction suspended, 1:10 P.M.	S, Mar. 29	S, Mar. 28
Instruction resumed, 7:30 A.M.	M, Apr. 7	M, Apr. 6
Spring term instruction ends, 1:10 P.M.	S, May 17	S, May 16
Independent study period begins	M, May 19	M, May 18
Final examinations begin	M, May 26	M, May 25
Final examinations end	T, June 3	T, June 2
Commencement Day	M, June 9	M, June 8
Deadline: changed or make-up grades	M, June 16	M, June 15

CORNELL UNIVERSITY ANNOUNCEMENTS

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The courses and curricula described in this Announcement, and the teaching personnel listed therein, are subject to change at any time by official action of Cornell University.

GRADUATE SCHOOL OF NUTRITION

UNIVERSITY ADMINISTRATION

James A. Perkins, President of the University
Dale R. Corson, University Provost
Mark Barlow, Jr., Vice President for Student Affairs
John E. Burton, Vice President – Business
Lewis H. Durland, University Treasurer
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Franklin A. Long, Vice President for Research and Advanced Studies
E. Hugh Luckey, Vice President for Medical Affairs
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Paul L. McKeegan, Director of the Budget
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Steven Muller, Vice President for Public Affairs
Arthur H. Peterson, University Controller
Robert L. Sproull, Vice President for Academic Affairs
Neal R. Stamp, Secretary of the Corporation, and University Counsel

ADMINISTRATION OF THE GRADUATE SCHOOL OF NUTRITION

James A. Perkins, President of the University
Dale R. Corson, Provost of the University
Robert L. Sproull, Vice President for Academic Affairs of the University
Richard H. Barnes, Dean of the School
Charlotte M. Young, Secretary of the School

FACULTY

The titles and departments (or sections) of primary affiliation of faculty members are indicated.

Armbruster, Gertrude D., Ph.D., Associate Professor, Food and Nutrition
Baker, Robert C., Ph.D., Professor, Poultry Science
Barnes, Richard H., Ph.D., Professor, Graduate School of Nutrition
Bensadoun, André, Ph.D., Associate Professor, Poultry Science
Buck, Paul A., Ph.D., Associate Professor, Food Science
Call, David L., Ph.D., Associate Professor, H. E. Babcock Professorship of Food Economics, Graduate School of Nutrition
Comar, Cyril L., Ph.D., Professor, Physical Biology
Daniel, Louise J., Ph.D., Professor, Biochemistry
Darling, C. Douglas, M.D., Professor, University Health Services
Donald, Elizabeth A., Ph.D., Associate Professor, Food and Nutrition
Finn, Robert K., Ph.D., Professor, Chemical Engineering

6 FACULTY

- Gaylor, James L., Ph.D., Associate Professor, Graduate School of Nutrition
- Hackler, L. Ross, Ph.D., Associate Professor, Food Science and Technology, Geneva
- Hand, David B., Ph.D., Professor, Food Science and Technology, Geneva
- Hartman, John D., Ph.D., Professor, Vegetable Crops
- Hester, E. Elizabeth, Ph.D., Professor, Food and Nutrition
- Hogue, Douglas E., Ph.D., Associate Professor, Animal Science
- Isenberg, F. M. R., Ph.D., Professor, Vegetable Crops
- Krook, Lennart, D.V.M., Ph.D., Professor, Pathology
- Leach, Roland M., Ph.D., Associate Professor, Poultry Science
- Lengemann, Frederick W., Ph.D., Professor, Physical Biology
- Loosli, John K., Ph.D., Professor, Animal Science
- Lutwak, Leo, Ph.D., M.D., James Jamison Professor of Clinical Nutrition, Graduate School of Nutrition
- Mattick, Leonard R., Ph.D., Associate Professor, Food Science and Technology, Geneva
- Maynard, Leonard A., Ph.D., Professor Emeritus, Graduate School of Nutrition
- McCormick, Donald B., Ph.D., Associate Professor, Graduate School of Nutrition
- Merrill, William G., Ph.D., Associate Professor, Animal Science
- Mondy, Nell, Ph.D., Associate Professor, Food and Nutrition
- Morrison, Mary A., Ph.D., Professor, Food and Nutrition
- Moyer, James C., Ph.D., Professor, Food Science and Technology, Geneva
- Nelson, Walter L., Ph.D., Professor, Biochemistry
- Nesheim, Malden C., Ph.D., Associate Professor, Poultry Science
- Newman, Katherine J., Ph.D., Associate Professor, Food and Nutrition
- Ogawa, Shozo, Ph.D., M.D., Assistant Clinical Professor, Graduate School of Nutrition
- Pond, Wilson G., Ph.D., Associate Professor, Animal Science
- Reid, John Thomas, Ph.D., Professor, Animal Science
- Rivers, Jerry Margaret, Ph.D., Associate Professor, Food and Nutrition
- Robinson, Willard B., Ph.D., Professor, Food Science and Technology, Geneva
- Roe, Daphne Anderson, M.D., Assistant Clinical Professor, Graduate School of Nutrition
- Scott, Milton L., Ph.D., Professor, Poultry Science
- Seeley, Harry W., Jr., Ph.D., Professor, Microbiology
- Shallenberger, Robert S., Ph.D., Professor, Food Science and Technology, Geneva
- Smith, Sedgwick E., Ph.D., Professor, Animal Science
- Smock, Robert M., Ph.D., Professor, Pomology
- Snook, Jean T., Ph.D., Assistant Professor, Food and Nutrition
- Steinkraus, Keith H., Ph.D., Professor, Food Science and Technology, Geneva
- Turk, Kenneth L., Ph.D., Professor, Animal Science

VanBuren, Jerome P., Ph.D., Associate Professor, Food Science and
Technology, Geneva
van Veen, André G., Ph.D., Professor, Graduate School of Nutrition
Visek, Willard J., Ph.D., M.D., Professor, Animal Science
Warner, Richard G., Ph.D., Professor, Animal Science
Wasserman, Robert H., Ph.D., Professor, Physical Biology
Wellington, George H., Ph.D., Professor, Animal Science
Williams, Harold H., Ph.D., Professor, Biochemistry
Wright, Lemuel D., Ph.D., Professor, Graduate School of Nutrition
Young, Charlotte M., Ph.D., Professor, Graduate School of Nutrition
Young, Robert J., Ph.D., Professor, Poultry Science
Zilversmit, Donald B., Ph.D., Professor, Graduate School of Nutrition



Cornell University

GRADUATE SCHOOL OF NUTRITION

The Graduate School of Nutrition was founded in 1941 as a center for graduate training and research in nutrition at Cornell. The only school of its kind, it offers a program of instruction that prepares its graduates for professional work or more advanced training in nutrition and the sciences related to nutrition.

At one time, the study of nutrition was limited to training in biochemistry, physiology, and biology, and the relationship of these sciences to health and disease. Today nutritional science must also be related to such disciplines as the behavioral sciences, food technology, economics, and education. And the Graduate School of Nutrition provides advanced study in such an integrated program that leads to the professional degree, Master of Nutritional Science (M.N.S.).

For students interested especially in the biological and physical sciences, a rapidly developing field is that of nutritional biochemistry. Today the science of nutrition cannot exist separately from fundamental biochemistry; the two areas are closely allied, and the science of nutrition is generally considered a branch of biochemistry. One function of modern nutrition is the development of biochemical knowledge that can be applied to the intact organism. The research programs of the Graduate School of Nutrition are aligned with heavy emphasis on fundamental biochemistry in areas ranging from the study of enzymological phenomena at a subcellular level to the application of biochemistry in experimental animals and in man, both normal and diseased.

Over the years, the effectiveness of several specific strengths of the School have been demonstrated. Among these are its faculty of outstanding scientists, its predetermined program of basic sciences, its high standards for admission and graduation, and its concentration on a professional area of science. Because the School

is relatively small, intangible advantages accrue through the students' opportunities for close association with the professors and their research, and with other students having similar and yet diverse interests.

The fundamental nature of the School's program makes it possible to offer specialized graduate study in nutrition for students who have had no previous course work in the subject—contrary to the requirements in most other such programs. And for students who are interested in the biological sciences, but who are not certain of the field of graduate work they wish to enter, the School's program fills a special need. Because nutritional science is closely related to many areas of basic biology, the Master of Nutritional Science degree program has proved particularly valuable in helping students decide upon a field of graduate study for the Ph.D. degree. The background core of basic sciences may be used toward completion of the Ph.D. degree in such fields as biochemistry, physiology, and food technology, as well as nutrition—both human and animal. A large proportion of the School's graduates continue advanced study for the Ph.D. degree.

The caliber of positions held by graduates of the School reflects the quality of training they receive. Many are engaged in significant laboratory research involving experimental biochemistry, as well as animal and human studies. Others hold responsible positions in government, private and international agencies, working with the nutrition and food technology problems of large populations. Many graduates are on the faculties of academic institutions throughout the world.

For those students who are more interested in a career in food science and technology, the School offers specialized training that leads to the degree, Master of Food Science (M.F.S.). This program, also based on a prescribed core of basic sciences, prepares students for careers in government and industrial laboratories and in feed companies and for positions involving food research and food production, both in this country and in the developing countries of the world.

FACULTY ORGANIZATION

Because the School serves as an integrating center for graduate academic and research programs in nutrition at Cornell, the faculty of a number of departments and divisions of the University are drawn upon to provide counseling and instruction in the School's program. Many of these faculty members are appointed jointly in the Graduate School of Nutrition.

In addition, the School has its own core faculty with offices and laboratories in Savage Hall or in its Clinical Nutrition Unit in Sage

Hospital. Among these professors are biochemists, working in rather fundamental areas of nutritional biochemistry; clinicians working actively in nutritional research programs; experimental nutritionists using animals to replicate some of the more serious nutritional problems of man; public health nutritionists, training students for careers in community nutrition; and experts in international nutrition, conducting research and training students in those areas of nutrition which are to some extent, unique to the developing countries of the world.

The complete faculty of the School also includes animal nutritionists, food economists, food scientists, and specialists in related areas of agriculture and home economics.

Although frequently members of the core faculty serve as advisers in planning a student's curriculum and directing his special research problem, an adviser may be selected from among those on the complete faculty.

TRAINING IN SPECIALIZED FIELDS

Nutritional Science

The basic training for the M.N.S. degree emphasizes the physical and biological sciences and the basic principles of nutrition. Through appropriate electives, students learn to apply these principles in either human or animal nutrition. Facilities for research include biochemical, microbiological, and physiological laboratories, experimental animal quarters, a diet table for experimental work in human nutrition, and a metabolic unit in Cornell's Sage Hospital for the study of nutrition in relation to disease. Depending upon a student's interests, he has the opportunity to select the particular type of laboratory training in which he wishes to become proficient. Experience in such a laboratory may then become the basis of his special problem report.

One of the strengths of the School not found in many other institutions of nutrition is that training is provided in a number of specializations. Among these are:

Nutritional biochemistry	Human nutrition
Experimental animal nutrition	Public health nutrition
Agricultural animal nutrition	International nutrition
Clinical nutrition	

Special emphasis is achieved primarily through the choice of electives and the area selected for the special problem. As two of the areas, public health nutrition and international nutrition, involve special arrangements for field experience, they will be described in more detail.

Public health nutrition: Special opportunities are provided for students of appropriate background who wish to prepare themselves for work as community nutritionists with health and welfare agencies. Here, the approved electives will include certain phases of social science, the elements of public health, clinical and public health nutrition, and

appropriate informational service techniques. Opportunities for supervised experiences with community and health agencies are available for selected students. Students accepted for training in this area must plan financially for three to four weeks of residence away from Cornell to cover the field experience. Two weeks of this will be in the fall just before the academic year; the third and possible fourth week may be either during the spring recess or immediately following final examinations. In addition, suitable students are expected to spend a two-month period in the summer in "in-service" training in nutrition as applied to the community and to public health. Assistance will be given in making the necessary contacts. These opportunities will provide assignments which can be used as the basis for meeting the requirement for a report on an individual problem.

International nutrition: To meet the need for professionally trained men and women in government and international agencies, the School offers a program in international nutrition. Designed especially for American students, it is open also to others interested in the practical application of nutrition and food science to the problems of developing countries. The program includes courses in the sciences basic to nutrition that are extensive enough to equip students for a variety of careers in nutrition. Emphasis in electives is then placed on specialized study in problems and programs in international nutrition and related fields such as agriculture, public health, extension teaching, sociology, and anthropology. When the opportunity exists, field experience will be given. Training will also be integrated with agricultural and public health programs whenever possible. Several traineeships and assistantships are available to qualified students. For further details, request the descriptive leaflet, *Program in International Nutrition*, from the School.

Food Science

Growing emphasis on food—its availability, quality, processing, packaging, as well as its nutritive value—indicates a period of expanding opportunities for those trained in food science. The Graduate School of Nutrition offers programs for M.F.S. candidates which lead to careers in food production, research, quality control, technical sales, teaching, and government and international nutrition work.

Since all techniques for food processing and handling must be based on a thorough knowledge of food characteristics, the Graduate School of Nutrition prescribes an M.F.S. program emphasizing the sciences fundamental to the field, namely, chemistry, biochemistry, and bacteriology. The student who masters these sciences may easily learn the details of special food techniques on the job. His basic academic training therefore does not include specialized technology courses in food processing, packaging, and the like.

Work on the special problem may be carried on either at the Ithaca campus or at the New York State Agricultural Experiment Station at Geneva, New York. Staff members advise students and acquaint them

with the several research projects under way, including studies of food spoilage, flavor, composition, presentation, fermentation, and irradiation effects.

OPPORTUNITIES FOR CONTINUING GRADUATE STUDY FOR THE PH.D. DEGREE

More than half of the students completing Master's degrees at the School continue with advanced study toward a Ph.D. degree, with the fundamental training in the Master's degree programs providing an excellent background for this extended study.

At Cornell, all graduate programs for the Ph.D. degree are under the jurisdiction of the Graduate School of the University and are carried out by fields rather than by departments. Faculty members of the School of Nutrition hold appointments in certain fields of the Graduate School; the academic background of a professor determines the field in which he is appointed.

One of the contributions of the School of Nutrition to graduate education at Cornell University is through the participation of its core staff in the various graduate fields. In fact, graduate training and research are the major responsibilities of this core staff, whose primary affiliation in the University is with the School. Through this staff and its research, the School carries on programs of training for the Ph.D. degree in such areas as biochemistry, economics, and animal and human nutrition.

Thus, students coming up through the School's Master's degree programs have the advantage of being able to go on for advanced degrees without disturbing the continuity of their study. They can work with their same advisers, and with a research interest sparked by their professors during earlier association in the Master's degree programs.

As in all scholarly pursuits, training in research does not end with a Doctor's degree. It is becoming more and more common for students receiving the Ph.D. degree in the natural sciences to continue their training in research for one or two postdoctoral years. Mature scientists also frequently seek an opportunity to revitalize their research programs, using sabbatical or other types of leaves from their home institutions to come here for additional research experience. Thus there are always some of these scientists working at the postdoctoral level at the Graduate School of Nutrition; not only do they gain from the experience, but their presence here is stimulating to the staff and students of the School.

CURRICULUM AND DEGREES

The Graduate School of Nutrition offers a curriculum providing for specialization in either nutritional science or food science. The student receives a firm foundation in the sciences basic to his field, along with

practical preparation, through carefully chosen electives, for work in his professional career. In some instances, "in-service" training is also provided. The candidate for a degree also prepares a report of thesis caliber, representing 6 to 10 semester hours' credit and based on his original research on a special problem. Each student is assigned a faculty adviser in whose area of specialization his own interests lie. The adviser plans the curriculum and directs the student's special research problem.

The degrees of Master of Nutritional Science and Master of Food Science are awarded by the Cornell University Graduate School after satisfactory completion of courses considered basic to an understanding of nutritional or food science. These degrees represent a defined accomplishment in the area of professional interest.

The curriculum completed for the M.N.S. and M.F.S. degrees also establishes an excellent background for further advanced study. Students who have obtained these degrees frequently continue studies leading to the Ph.D. degree in such fields as biochemistry, physiology, food science and technology, and animal or human nutrition.

ADMISSION

To be admitted to the School the applicant must hold a baccalaureate degree from a college or university of recognized standing or have completed work equivalent to that required for such a degree. He must have a definite professional interest in the field of either nutritional science or food science.

Dean Barnes discussing a research problem with a graduate student.



Academic Admission Requirements

To qualify for admission, an applicant must have completed, with a superior record, courses in the following subjects with the approximate number of semester hours as stated.

PHYSICAL SCIENCES. A total of 20 hours divided among chemistry, physics, and mathematics. Courses in quantitative chemistry and organic chemistry are prerequisites to courses required for graduation. If they are not offered for entrance, they must be taken following admission. Students who enter without college training in physics are required to take an elementary course in that subject before graduation. Credits for beginning courses in physics and chemistry, including organic and quantitative analysis, cannot be counted toward the credits required for graduation.

BIOLOGICAL SCIENCES. A total of 12 hours in such courses as biology, botany, zoology, bacteriology, and physiology for candidates for the M.N.S. degree. Courses in animal or human nutrition up to three hours may be counted in the biological sciences. Elementary courses in bacteriology or physiology cannot be counted toward graduation. For candidates for the M.F.S. degree, eight hours are required in the biological sciences. Elementary courses in bacteriology cannot be counted toward graduation. However, an elementary course in bacteriology is prerequisite for advanced courses in bacteriology.

SOCIAL STUDIES. A total of nine hours in such subjects as economics, government, education, psychology, sociology, anthropology, and history.

OTHER COURSES. The applicant's record must show evidence that he has satisfactorily completed other courses prerequisite to those required by a candidate for a degree. An applicant who cannot meet in full the specific course requirements may be admitted if the faculty of the School so recommends, with the understanding that the deficiencies must be made up before graduation.

Nondegree Candidates

In some instances students may be admitted as nondegree candidates (special students) to take course work and special training in nutrition programs. Normally such students should have completed undergraduate study at the Bachelor's degree level although, with appropriate justification, this requirement may be waived. Special students are not subject to the standard requirements for admission to the Graduate School of Nutrition, nor to the requirements for course work to be completed for graduate degrees.

University Health Requirements on Entrance

The following health requirements for entering graduate students have been adopted by the Cornell Board of Trustees. Failure to fulfill these requirements will result in loss of the privilege of registering the following term. The responsibility for fulfilling these requirements rests with the student.

IMMUNIZATION. A satisfactory certificate of immunization against smallpox, on the form supplied by the University, must be submitted before registration. It will be accepted as satisfactory only if it certifies that within the last three years a successful vaccination has been performed. If this requirement cannot be fulfilled by the student's home physician, opportunity for immunization will be offered by the Cornell medical staff during the student's first semester, with the cost to be borne by the student. If a student has been absent from the University for more than three years, immunity will be considered to have lapsed, and a certificate of revaccination must be submitted.

It is strongly recommended by the University Health Services that all graduate students have immunization against tetanus before entering the University. All graduate students may, however, obtain initial and all booster tetanus toxoid immunizations at the Gannett Clinic for a nominal charge.

HEALTH HISTORY. Students accepted for admission will be required to submit health histories on forms supplied by the University.

X RAY. Every student is required to have a chest x ray. Opportunity is given to satisfy this requirement during the student's first week on campus. The cost of the x ray examination is included in the General Fee.

When a student who has been away from the University for more than a year wishes to re-enter, he must, at his own expense, once more fulfill the chest x ray requirement and also submit a new health history.

Applications and Registration

Applicants for admission should address their inquiries to the Office of the Graduate School, Sage Graduate Center, Cornell University, Ithaca, New York 14850. The form the applicant will receive is one which is used in all areas of graduate study and does not apply in all of its details to Graduate School of Nutrition applicants. In completing the form, applicants should indicate an interest in either *nutritional science for the M.N.S. degree* or *in food science for the M.F.S. degree in the Graduate School of Nutrition*. In neither program is it necessary

to indicate a minor area of study. No application will be acted upon until all credentials enumerated in the application form have been filed.

All students admitted to the Graduate School of Nutrition must register through the Graduate School Office, Sage Graduate Center, at the beginning of each term or session.

REQUIREMENTS FOR GRADUATION

For graduation a student must have completed at least two units of residence and at least 36 semester hours of specified and approved courses of which not more than 10 can be in research (Graduate School of Nutrition 199). In the event that certain required courses have been completed satisfactorily by the student prior to his admission to the Graduate School, substitutions will be made with the approval of his faculty adviser.

Certain elective courses may be required as deemed appropriate by the adviser and the faculty of the Graduate School of Nutrition to round out the student's professional training in nutritional science or food science. The student must prepare a written report on an approved problem that may or may not require laboratory research, and must pass a final examination. The curriculum differs in accordance with the field in which the student wishes to specialize, as follows:

Nutritional Science

The specialized training in the field of nutritional science, leading to the degree of Master of Nutritional Science, emphasizes the basic scientific knowledge and techniques of nutrition. The completion of the following curriculum is required:

	<i>Hours</i>		<i>Hours</i>
Biochemistry	7	Statistics	3
Principles of nutrition	3	Seminars	1
Laboratory work in nutrition	3	Advanced courses in human or	
Advanced physiology	6	animal nutrition	4
Food economics	3	Special problem	6 to 10

Faculty advising students for the M.N.S. degree include Professors R. H. Barnes, A. Bensadoun, D. L. Call, C. L. Comar, Louise J. Daniel, Elizabeth A. Donald, J. L. Gaylor, L. R. Hackler, D. E. Hogue, L. P. Krook, R. M. Leach, F. W. Lengemann, J. K. Loosli, L. Lutwak, D. B. McCormick, W. G. Merrill, Mary A. Morrison, W. L. Nelson, M. C. Nesheim, Katherine J. Newman, W. G. Pond, J. T. Reid, Jerry M. Rivers, Daphne A. Roe, M. L. Scott, S. E. Smith, Jean T. Snook, K. L. Turk, A. G. van Veen, W. J. Visek, R. G. Warner, R. H. Wasserman, H. H. Williams, L. D. Wright, Charlotte M. Young, R. J. Young, and D. B. Zilversmit.

COURSES APPROVED FOR ADVANCED NUTRITION CREDIT

		<i>Hours</i>
Animal Science 502	Lipids and Carbohydrates	2
Animal Science 503	Nutritional Energetics	2
Animal Science 504	Minerals and Vitamins	2
Animal Science 510	Special Topics in Animal Nutrition	1 ^a
Biological Sciences 530	Biochemistry of the Vitamins	2
Biological Sciences 537	Advanced Biochemistry	1 or 2 ^a
Biological Sciences 538	Advanced Biochemistry	1 or 2 ^a
Food and Nutrition 332	Principles of Human Nutrition	3 ^b
Food and Nutrition 441	Nutrition and Disease	3
Food and Nutrition 442	Advanced Human Nutrition	2
Food and Nutrition 501	Proteins and Amino Acids	2
Food and Nutrition 512	Nutrition and Growth	2
Food and Nutrition 514	Readings in Nutrition	2
Poultry Science 510	Advanced Poultry Nutrition	2
School of Nutrition 100	Problems and Programs in International Nutrition	3 or 4
School of Nutrition 160	Nutritional Biochemistry	3
School of Nutrition 381	Field Observation and Experience in Community Nutrition	1
School of Nutrition 382	Field Observation and Experience in Community Nutrition	1
School of Nutrition 392	Clinical and Public Health Nutrition	3
Veterinary Pathology 931	Pathology of Nutritional Diseases	3

^a Depending upon the topic.^b If equivalent not taken previously.

Food Science

The specialized training in this field, leading to the degree of Master of Food Science, emphasizes the sciences involved in food processing and utilization. The completion of the following curriculum is required:

	<i>Hours</i>		<i>Hours</i>
Biochemistry	7	Statistics	3
Advanced courses in bacteriology	6	Nutrition	3
Approved courses in food science	11	Seminars	1
		Special problem.....	6 to 10

In addition, the requirements include such approved electives as the faculty adviser and the faculty of the School may deem appropriate and necessary to round out the student's training in the field of food science.

Faculty advising students for the M.F.S. degree include Professors Gertrude D. Armbruster, R. C. Baker, R. H. Barnes, P. A. Buck, D. L. Call, R. K. Finn, D. B. Hand, J. D. Hartman, Elizabeth E.

Hester, F. M. R. Isenberg, L. R. Mattick, Nell Mondy, J. C. Moyer, W. L. Nelson, W. B. Robinson, H. W. Seeley, R. S. Shallenberger, R. M. Smock, K. H. Steinkraus, J. P. VanBuren, A. G. van Veen, G. A. Wellington, and L. D. Wright.

COURSES APPROVED FOR ADVANCED FOOD SCIENCE CREDIT

		<i>Hours</i>
Biological Sciences 530	Biochemistry of the Vitamins	2
Food Science 302	Dairy and Food Engineering	4
Food Science 401	Food from Fermentations	5
Food Science 404	Chemistry of Milk	2 ^a
Food Science 410	Food Biochemistry	3
Food Science 413	Analytical Methods	4
Food and Nutrition 446	Science of Food	3 or 4
Food and Nutrition 447	Science of Food, Laboratory	1
Food and Nutrition 456	Experimental Food Methods	2
Food and Nutrition 500	Special Problems for Graduate Students	^b
Food and Nutrition 516	Readings in Food	2
School of Nutrition 100	Problems and Programs in International Nutrition	3 or 4
School of Nutrition 159	Food Economics	3
School of Nutrition 250	Seminar in World Problems of Food and Population	2
Pomology 201	Post-harvest Physiology, Handling and Storage of Fruits	3
Poultry Science 450	Poultry Meat and Egg Technology	3
Vegetable Crops 222	Potato Production and Processing	3
Vegetable Crops 412	Handling and Marketing Vegetables, Advanced Course	4

^a Depending upon the topic.

^b Credits as arranged.

Special Problem and Examinations

The work involved in the report on an individual problem required for both degrees may be carried out with the approval of the student's faculty adviser under the direction of any member of the faculty of the School whom the student may choose and who is willing to supervise it. The report must be approved by the supervising faculty member and the original copy submitted to the Office of the Dean of the Graduate School of Nutrition at least one week prior to the beginning of the final examination period. Directions concerning the form in which the report is to be presented may be obtained either from the student's faculty adviser or from the Office of the Dean of the Graduate School of Nutrition.

A final examination, either oral or written or both, is required for either degree. Examinations are conducted by a committee consisting of the faculty adviser plus one other member to be designated by the faculty of the Graduate School of Nutrition or its delegated agent.

Residence Requirements

To receive a degree from the School, a student must complete at least two terms of residence after receiving the Bachelor's degree from Cornell or elsewhere. (In most instances, students need more than two terms of residence in which to complete all degree requirements.)

SUMMER SESSION STUDY

A student registered in the School may receive credit for work done in the University Summer Session if his program is approved in advance by his faculty adviser. To receive this credit he must also be registered in the Summer Session. A student who has been registered in the School for one term after receiving his Bachelor's degree may, with the approval of his faculty adviser, register for a minimum of four and a maximum of twelve weeks for work in the summer on his individual problem under personal direction of a member of the faculty of the School and thus earn residence credit. The student can thus make use of the summer period to meet, in whole or in part, the requirements of six to ten hours granted upon the completion of his report on an approved problem.

TUITION AND FEES

A registration fee of \$28 must be made by every applicant accepted for admission unless the candidate has previously matriculated as a student at Cornell University. A check or money order payable to Cornell University should be remitted to the Graduate School, Sage Graduate Center, upon notification of acceptance. This fee pays the matriculation fee, chest x ray fee, and examination book charge and covers certain expenses incident to graduation if the student receives a degree. The fees will not be refunded to any candidate who withdraws his application after May 22, or after 20 days following his admission approval.

The tuition for students registered in the Graduate School of Nutrition is \$200 per term payable at the beginning of each term. Certain assistantships carry a waiver of tuition.

A General Fee of \$275 a term payable at the beginning of each term is required of each registrant of the Graduate School of Nutrition. The General Fee contributes toward the services supplied by the libraries, Clinic and Sage Hospital, and the student union in Willard

Straight Hall, and pays a portion of the extra cost of laboratory courses and general administration.

Limited refunds of tuition and fixed fees will be made to students who withdraw from the University prior to the completion of a term, for reasons accepted as satisfactory. For students who do not complete a term, tuition and other fees will be charged at the rate of 10 per cent for each week, or fraction of a week, from the first day of registration to the date of withdrawal as certified by the School; if, however, withdrawal is made within six days of the date of registration, no charge is assessed. The registration deposit will not be refunded.

Students of the Graduate School of Nutrition who attend classes in the Summer Session must register both in the Graduate School and in the Summer Session and pay the tuition and other fees required by the Summer Session. No fee is required for Summer Research if a student was regularly registered in the Graduate School during the previous academic year.

A graduate student who returns to the University to present his thesis and to take the final examination for an advanced degree, all other work for that degree having been previously completed, must register as a "candidate for degree only" and pay a fee of \$35.

If it is necessary for a student to withdraw, he should make arrangements at the Graduate School office before leaving the campus.

Tuition or fees may be changed by the Board of Trustees at any time without previous notice.

ASSISTANTSHIPS AND TRAINEESHIPS

A number of assistantships and traineeships are available in the School's research programs, and any student admitted to the School may apply for this type of financial aid. The term of appointment and stipend for each appointment will be worked out on an individual basis after the student has been accepted by the Graduate School. For September appointment, application should be made by March 1 to the Secretary, Graduate School of Nutrition, Savage Hall. Announcement of appointments will be made on or about April 1.

Traineeships in Public Health

Students interested in preparing for positions as public health nutritionists may apply for public health traineeship awards from the U.S. Public Health Service. Applicants may secure application forms and additional information from any of the Regional Medical Directors of the U.S. Public Health Service or from the Chief, Division of General Health Services, Bureau of State Services, Public Health Service, Department of Health, Education, and Welfare, Washington, D.C.



ADVISORY SERVICE FOR STUDENTS PREPARING AT CORNELL TO ENTER THE SCHOOL

Students in the Colleges of Agriculture, Arts and Sciences, or Home Economics at Cornell University, who prepare for admission to the Graduate School of Nutrition, may be advised during the period of preparation by members of the faculty of the School who are also members of the faculty of the college in which the students matriculate.

Undergraduates who are interested in nutrition and who are matriculating at Cornell University for the first time should state upon the application for admission that nutrition is the business or profession (field of work) which they expect to enter upon completion of their studies. This is necessary in order that appropriate faculty advisers may be assigned to them.

HEALTH SERVICES AND MEDICAL CARE

Health services and medical care for students are centered in two Cornell facilities: the Gannett Medical Clinic (out-patient department) and the Sage Hospital. Students are entitled to unlimited visits at the Clinic (appointments with individual doctors at the Clinic may be made, if desired, by calling or coming in person; an acutely ill student will be seen promptly whether he has an appointment or not). Students are also entitled to laboratory and x ray examinations indicated for diagnosis and treatment, hospitalization in the Sage Hospital with medical care for a maximum of fourteen days each term, and emergency surgical care. The cost of these services is covered in the General Fee.

On a voluntary basis, insurance is available to supplement the services provided by the General Fee. For further details, including charges for special services, see the *Announcement of General Information*. If, in the opinion of the University authorities, the student's health makes it unwise for him to remain in the University, he may be required to withdraw.

If a student prefers to consult a private physician rather than go to the Clinic, or to have the services of a private doctor while a patient in the Hospital, he must bear the cost of these services.

HOUSING FOR GRADUATE STUDENTS

DORMITORY ACCOMMODATIONS. The University has established Sage Hall as a graduate residential center. Its dormitory facilities accommodate approximately 100 men in the north side of the building and 105 women in the south side. The Graduate Center, which is available for use by all graduate students and faculty, also contains a cafeteria seating 200, study rooms, and lounges. In addition, Cascadilla Hall has been newly remodeled to accommodate approximately 140 single graduate men.

Gas chromatographic analysis being used by Professor Zilversmit (center) in a cholesterol study.

Applications for dormitory accommodations may be made any time after January 1 for the coming academic year by writing the Department of Housing and Dining Services, 223 Day Hall.

FAMILY ACCOMMODATIONS. The University, through the Department of Housing and Dining Services, has three apartment developments for married students and their families. They are Cornell Quarters, Pleasant Grove Apartments, and Hasbrouck Apartments, with total housing for about 400 families. All apartments are unfurnished. For further information and application, write the Department of Housing and Dining Services, Room 223, Day Hall.

The Department of Housing and Dining Services also maintains a list of available rental housing in the Ithaca area. Information on housing currently available can be obtained only at the Off-Campus Housing Office, Room 223, Day Hall. Lists cannot be sent out because changes occur daily. Students desiring off-campus housing should come to Ithaca well in advance of the term opening to arrange for such accommodation.

DESCRIPTION OF COURSES

The following list of courses includes both those specified previously as required for the degrees offered and some of those from which the student may select electives, with the approval of his faculty adviser, in accordance with his specific field of interest.

The information in parentheses following the name of the course refers to the department or the division in which the course is given, and the course number. In registering for any of these courses, list the course number and the department or division immediately preceding it, rather than the name of the course. The time and, in some instances, the place are not given in the descriptive material following the title of the course. To obtain this information the student should consult the specific departmental office or the individual Announcements issued by the colleges concerned.

Courses marked with an asterisk () are acceptable to meet the "advanced nutrition" credit requirement. Those marked with a dagger (†) are acceptable to meet the "advanced food science" credit requirement.*

NUTRITION

In this area some courses are oriented more toward human nutrition and some more toward animal nutrition. As courses based on experimental animal nutrition are often fundamental to a knowledge of human nutrition, a clear-cut distinction is not implied in the following course groupings.

ADVANCED NUTRITION SERIES (501-504)

A series of nutrition courses offered jointly by the Department of Food and Nutrition, College of Home Economics; the Departments of Animal and of Poultry Husbandry, College of Agriculture; and the Graduate School of Nutrition. Prerequisites: courses in nutrition, physiology, and biochemistry to include intermediary metabolism; or permission of the instructor.

The biochemical and physiological bases of digestion, absorption, transport and metabolism of nutrients; species differences where applicable; and historical as well as current concepts in nutrition.

PROTEINS AND AMINO ACIDS

(Food and Nutrition 501)

Fall. Credit two hours. Van Rensselaer 339. Professor Morrison.*

LIPIDS AND CARBOHYDRATES

(Animal Science 502)

Fall. Credit two hours. Rice 300. Associate Professor Bensadoun.*

NUTRITIONAL ENERGETICS

(Animal Science 503)

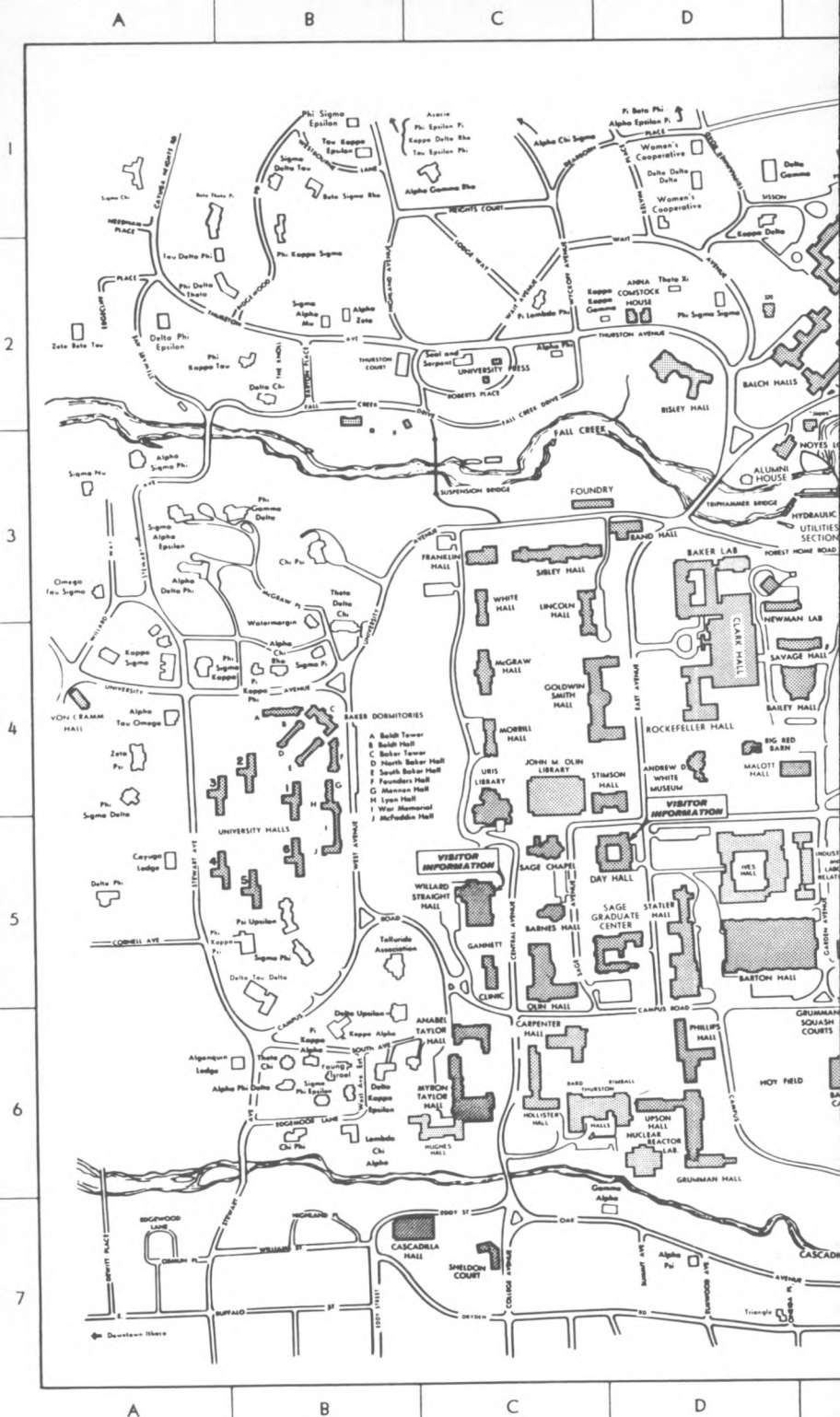
Spring. Credit two hours. Morrison 342. Professor Reid.*



KEY TO THE CAMPUS MAP ON THE FOLLOWING PAGES

- Agronomy F4
- Alumni (Athletic) Fields F5
- Alumni House D3
- Artificial Breeders H7
- Bacon Athletics Cage E6
- Bailey Hall E4, auditorium
- Baker Residences (men) B4
- Baker Laboratory D3, chemistry
- Balch Halls E2, women's residences
- Bard Hall C6, materials science & eng.
- Barnes Hall C5, Campus Store, auditorium
- Barton D5, military training, Safety Div.
- Beebe Lake; Tripphammer Falls E-F3
- Big Red Barn D4, alumni center
- Caldwell Hall E4, agronomy
- Campus Store, Barnes-C5, Sheldon Ct.-C7
- Career, Summer Plans, & Placement Ctr., 14 East Av. (next to Sage Ctr.)
- Carpenter C6, eng. library & admin.
- Cascadilla Hall B7
- Clark Hall D4, physical sciences
- Collyer Boat House, Cayuga Lake Inlet
- Comstock Hall E4, entomology, limnology
- Comstock House D2, women's residence
- Cornell Quarters F-G7, student families
- Crescent E6, football stadium
- Dairy Cafeteria (Stocking Hall) G-H5
- Day Hall C-D5, Univ. administration
- Dickson Hall E2, women's residence
- Donlon Hall E1, women's residence
- Fernow Hall F4, conservation
- Filter Plant J3
- Fishery Lab. J7
- Food Storage & Laundry F7
- Foundry C3, architecture studio
- Franklin Hall C3, art, Asian studies
- Gannett Medical Clinic C5
- Goldwin Smith Hall C4, arts & sciences
- Golf Course H2
- Graphic Arts Services G6
- Greenhouses F4, H4
- Grumman D6, aero. eng.
- Grumman Squash Courts F6
- Hasbrouck Apts. G1, student residences
- Heating Plant F6
- High Voltage Lab. H7, 909 Mitchell St.
- Hollister Hall C6, civil eng.
- Hoy Field D6, baseball
- Hughes Hall C6, law student residence
- Hydraulics (Applied) Lab. E3
- Ind. & Labor Relations Conf. Ctr. E5
- Ives Hall D5, industrial & labor relations, summer session & extramural courses, Univ. personnel office
- "Japes" E2, recreation, meetings
- Judging Pavilion H5
- Kimball Hall D6, materials processing
- Langmuir Lab., Research Pk. H2
- Library Tower C4
- Lincoln Hall C3, music, speech & drama
- Lynah Hall E-F5, ice skating
- Malott Hall D4, business & public admin., hospital admin.
- Mann F4, agric.-home econ. library, Finance Office, Bailey Hortorium
- McGraw Hall C4, geological sciences, sociology, anthropology
- Minns Garden E4
- Moakley House H2, recreation, golf
- Morrill Hall C4, modern lang., psych.
- Morrison Hall H5, animal husbandry
- Helen Newman Hall E2, women's phys. ed.
- Newman Lab. D-E3, nuclear studies
- Noyes Lodge E3, recreation, cafeteria
- Noyes Student Center A5
- Nuclear Reactor Lab. D6
- Observatory F2
- Olin Hall C5, chemical engineering
- Olin (Grad. & Research) Library C4
- Ornithology H1-2, Sapsucker Woods Rd. via Warren & Hanshaw Rds.
- Phillips D6, elec. eng.
- Plant Science E4, genetics, development, and physiology
- Pleasant Grove Apts. F1, student families
- Post Lab. H4, floriculture
- Poultry Research F4
- Poultry Virus Disease Lab. J5
- Radiation Biology Lab. H2, Warren Rd.
- Radiophysics & Space Research D4
- Rand D3, Computing Ctr.
- Research Park H2
- Rice Hall F4, poultry husbandry
- Riding Hall & Stables F6, Rt. 366
- Riley-Robb Hall G5, agric. eng.
- Risley Hall D2, women's residence
- Roberts Hall E4, agric. admin., biol. sciences, veg. crops
- Rockefeller Hall D4, physics, eng. physics
- Sage Chapel C5
- Sage Graduate Center D5
- Savage Hall D-E4, nutrition
- Schoellkopf Field and Hall E6, athletics
- Service Building F7
- Sheldon Ct. C7, Univ. Publications, Off-Campus Housing, Campus Store
- Sibley Hall C3, arch., art, and planning; history, govt.
- Statler Hall D5, hotel administration
- Stimson Hall D4, ecology & systematics
- Stocking Hall G5, dairy & food science, neurology & behavior, microbiology
- Stone Hall E4, education
- Suspension Bridge C3
- Synchrotron Bldg. G6
- Taylor (Anabel) Hall C6, interfaith ctr.
- Taylor (Myron) Hall C6, law
- Teagle Hall E5, men's phys. ed., sports
- Television-Film Center H5
- Thurston Court B2, student residences
- Thurston C6, theoretical & applied mech.
- Toboggan Lodge E3, recreation
- University, Sperry, Class of '17, & Class of '26 Halls (men) B5
- University Press C2
- Upson Hall D6, mech. eng., computer sci.
- Uris (Undergraduate) Library C4
- U. S. Nutrition Lab. H4
- Utilities Section E3
- Van Rensselaer Hall E4, home economics
- Veterinary College J4
- Veterinary Virus Research Lab. H7
- Visitor Information C5 and D5
- von Cramm Scholarship Hall (men) A4
- Warren F4, agric. econ., rural sociol.
- White Hall C3, mathematics
- White Museum of Art D4
- Willard Straight Hall C5, student union
- Wing Hall G5, biochem., molec. biol.

Professor Young and a graduate assistant preparing collection flasks for a body composition study.



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30 NUTRITION

MINERALS AND VITAMINS

(Animal Science 504)

Spring. Credit two hours. Rice 300. Professor Scott.*

[NUTRITIONAL BIOCHEMISTRY]

(School of Nutrition 160)

Spring. Credit three hours. Prerequisites, Biological Sciences 431 or the equivalent and a beginning course in nutrition, e.g., Animal Science 410, Poultry Science 310, or Food and Nutrition 332. Lectures. Savage 100. Professors R. H. Barnes and Wright and Associate Professors Gaylor and McCormick.*

The biological bases of processes related to nutrition in the intact animal are discussed. Emphasis is placed on the integration of physiological and biochemical mechanisms in digestion, absorption, transport, and metabolism and include comparative aspects of the normal and pathologic states. Not offered in 1968.

Human Nutrition

RESEARCH METHODS IN HUMAN METABOLIC STUDIES

(Food and Nutrition 524)

Spring. Credit three hours. Prerequisites, Food and Nutrition 332 or equivalent, laboratory experience in biochemistry or quantitative analysis, and permission of the instructor. Lecture and laboratory. Van Rensselaer 353. Assistant Professor Snook and department faculty.

Principles of human metabolic research; experimental design of human studies; dietary considerations; methods of collecting and analyzing biological material; and evaluation. Laboratory will include planning and management of a metabolic study, collection and the appropriate analysis of blood, urine, and feces.

READINGS IN NUTRITION

(Food and Nutrition 514)

Spring. Credit three hours. Prerequisite, Food and Nutrition 332 or equivalent. Van Rensselaer 301. Associate Professor Donald.*

Critical review of literature on selected topics in the field of nutrition. Emphasis on human nutrition. Topics are changed each term, so that the course may be repeated for credit with permission of the instructor.

NUTRITION AND GROWTH

(Food and Nutrition 512)

Fall. Credit two hours. Prerequisite, Food and Nutrition 332 or equivalent. Signature of instructor required for undergraduate students. Van Rensselaer 301. Associate Professor Newman.*

Information on growth which is of particular interest to nutritionists. Survey of methods used in studying physical and chemical growth. Relation between nutrition and growth.

ADVANCED HUMAN NUTRITION

(Food and Nutrition 442)

Fall. Credit two hours. Prerequisite, Food and Nutrition 332 or equivalent. Van Rensselaer 339. Professor Morrison.*

Recent advances in nutrition. Emphasis on human nutrition.

NUTRITION AND DISEASE

(Food and Nutrition 441)

Fall. Credit three hours. Prerequisite, Food and Nutrition 332 or equivalent. Discussion. Van Rensselaer 3-M-11. Associate Professor Rivers.*

Study of the physiological and biochemical anomalies in certain diseases and the principles underlying nutritional therapy. Independent survey of the technical literature in this field.

PRINCIPLES OF HUMAN NUTRITION

(Food and Nutrition 332)

Spring. Credit three hours. Prerequisites, Food and Nutrition 112 or 115 and a college course in biochemistry and in physiology. Discussion. Van Rensselaer 339. Associate Professor Newman.*

Principles of nutrition as they relate to energy metabolism, proteins, fats, minerals, and vitamins. Use of professional literature to acquaint the student with considerations involved in the application of nutrition information to human nutrition problems, to illustrate methods used in studying nutrition, and to provide experience in interpretation of scientific reports.

MATERNAL AND CHILD NUTRITION

(Food and Nutrition 322)

Fall and spring. Credit two hours. Prerequisite, Food and Nutrition 112 or 115. Not designed for Food and Nutrition majors. Majors with special interest in this subject may request permission to register for Food and Nutrition 512 as seniors. Lecture and discussion. Van Rensselaer 339. Associate Professor Newman.

Family nutrition with special emphasis upon the nutritional needs of the mother and child. Relation of nutrition to physical growth.

PROBLEMS AND PROGRAMS IN INTERNATIONAL NUTRITION

(School of Nutrition 100)

Fall. Credit three hours (Problems section only) or four hours. Registration by permission. Savage 100. Professor van Veen.*†

Problems section: To acquaint students who have a satisfactory knowledge of nutrition with the specific problems of human nutrition, food science, and food supplies in developing countries; emphasis is placed on the role of agriculture and public health. Among topics discussed are typical foods and dietary patterns in various parts of the world, assessment of food and nutrition conditions, protein-rich and other protective foods, food processing and preservation in developing countries, food standards, and food control.

Programs section: The planning of effective programs and policies in the fields of nutrition and food science for the purpose of improving nutrition conditions in developing countries.

CLINICAL AND PUBLIC HEALTH NUTRITION

(School of Nutrition 392)

Spring. Credit three hours. Prerequisites, a course in nutrition, in physiology, and in biochemistry. Registration by permission of the instructor. For graduate students only. Savage 136. Professor C. M. Young and Assistant Professor Roe.*

Designed to familiarize the student with some of the applications of nutrition to clinical and public health problems.

**FIELD OBSERVATION AND EXPERIENCE IN
COMMUNITY NUTRITION**

(School of Nutrition 381-382)

Throughout the year. Credit one hour (a term). Prerequisites (or in conjunction with), School of Nutrition 392 and Engineering 2509. Registration by permission only. For graduate students only. A two-week full-time field period just prior to the academic year and one to two weeks during the spring recess and/or immediately following final examinations in the spring term. Time and place as arranged. Professor C. M. Young.*

Supervised observation and experience in community nutrition programs. Students must be prepared to defray expense of living costs in the communities selected for the field experience. Every effort will be made to keep costs minimal.

Animal Nutrition**LABORATORY WORK IN ANIMAL NUTRITION**

(Animal Science 511)

Spring. Credit three hours. Prerequisites, quantitative analysis and Animal Science 410, or its equivalent, and permission of the instructor. Morrison 342 and 443. Professor Warner.

Each student engages in a series of short research projects with experimental animals, such as rats, dogs, and sheep. Both classical and modern techniques of animal experimentation are taught. The applications of biochemical methods to the solution of animal nutrition problems are included.

SPECIAL TOPICS IN ANIMAL NUTRITION

(Animal Science 510)

Spring. Credit one hour. Registration by permission. Morrison 342. Professors Reid and S. E. Smith.*

A presentation and discussion of the knowledge and techniques of special fields of animal nutrition, with particular reference to farm animals.

PRINCIPLES OF ANIMAL NUTRITION

(Animal Science 410)

Fall. Credit three hours. Prerequisites, a course in human or veterinary physiology and a course in organic chemistry or biochemistry. Lectures. Morrison 342. Professor Loosli.

The chemistry and physiology of nutrition and the nutritive requirements for growth, reproduction, lactation, and other body functions.

ADVANCED POULTRY NUTRITION

(Poultry Science 510)

Spring. Credit three hours. For graduate students only. Not given every year and not unless ten or more students apply for the course. Rice 201. Professor Scott.*

A study of one or more important fields of research in poultry nutrition, a critical consideration of the experimental methods used in conducting the investigations, and discussion of further studies needed, including the planning of the experiments.

POULTRY NUTRITION

(Poultry Science 310)

Spring. Credit three hours. Prerequisite, chemistry and physiology or permis-

sion of instructor. Not open to freshmen. Lectures. Rice 101. Associate Professor Nesheim.

The principles of poultry nutrition and their application to poultry feeding and feed manufacturing.

Seminars

NUTRITION SEMINAR

(School of Nutrition 292)

Spring. Credit one hour. Savage 100. Professor R. H. Barnes and faculty.

SEMINAR IN NUTRITION

(Food and Nutrition 602)

Fall. Credit one hour. Van Rensselaer 339. Associate Professor Donald and department faculty.

SEMINAR IN ANIMAL NUTRITION

(Animal Science 619)

Fall. Credit one hour. Open to graduate students with major or minor field of study in animal nutrition. Registration by permission. Morrison 348. Animal Nutrition staff.

A critical review of the literature and other topics of special interest to graduate students in animal nutrition.

PUBLIC HEALTH

CLINICAL AND PUBLIC HEALTH NUTRITION

(School of Nutrition 392)

Spring. Credit three hours. Prerequisites, a course in nutrition, in physiology, and in biochemistry. Registration by permission of the instructor. For graduate students only. Savage 136. Professor C. M. Young and Assistant Professor Roe.*

Designed to familiarize the student with some of the applications of nutrition to clinical and public health problems.

FIELD OBSERVATION AND EXPERIENCE IN COMMUNITY NUTRITION

(School of Nutrition 381-382)

Throughout the year. Credit one hour (a term). Prerequisites (or in conjunction with), School of Nutrition 392 and Engineering 2509. Registration by permission only. For graduate students only. A two-week full-time field period just prior to the academic year and one to two weeks during the spring recess and/or immediately following final examinations in the spring term. Time and place as arranged. Professor C. M. Young.*

Supervised observation and experience in community nutrition programs. Students must be prepared to defray expense of living costs in the communities selected for the field experience. Every effort will be made to keep costs minimal.

ENVIRONMENTAL SANITATION

(Engineering 2509)

Fall. Credit three hours. Open to noncivil engineering students. Hollister 202. Professor Gates.

Lectures, discussions, reports and field trips. Environmental health concepts and methods and their application to environmental planning and control at the subdivision, municipal, and metropolitan levels. Introduction to water resource planning and development; water quality control; water supply; municipal, industrial, and private waste-water disposal; air quality control; solid waste disposal and radiological health.

INTRODUCTION TO CLINICAL MEDICINE AND PUBLIC HEALTH PROGRAMS

(Business and Public Administration 141)

Spring. Credit three hours. Malott Hall. Visiting Professor Samson.

The objective of this course is to familiarize the student with the principal diseases of modern life and to demonstrate how these conditions are controlled in individuals and in communities. Major emphasis is given to those conditions which directly affect the management of hospitals. Consideration is given to the training of physicians, medical and surgical specialists, nurses, and other personnel; the nature of specialized hospital equipment and other facilities for diagnosis and treatment; and the principal procedures used by physicians in diagnosis and treatment in hospitals and in their offices. For those diseases amenable to group action for community-wide control, the nature of control measures by various public and private agencies and the effectiveness of legislation and of voluntary action in such control are examined. Major public health problems of various parts of the contemporary world are discussed, and visits are made to nearby hospitals and medical centers at appropriate points in this course.

SEMINAR IN HEALTH RESEARCH

(Business and Public Administration 455)

Fall. Credit three hours. Malott Hall. Associate Professor White.

The primary objective is to increase the student's ability to evaluate research reports and other studies, to assess their relevance for the field, and to formulate his own problems in a manner conducive to scientific investigation. An examination is made of the contributions of the social sciences and other disciplines to an understanding of current problems in the health field and in hospital administration in particular.

BIOCHEMISTRY

PRINCIPLES OF BIOCHEMISTRY, LECTURES

(Biological Sciences 431)

Fall. Credit four hours. Prerequisites, Organic Chemistry 353-355 or the equivalent. Lectures, M, Morrison 146; T Th S, Plant Science 233. Professor Daniel.

A basic course dealing with the chemistry of biological substances and their transformations in living organisms.

PRINCIPLES OF BIOCHEMISTRY, LABORATORY

(Biological Sciences 432)

Spring. Credit three hours. Prerequisites, quantitative analysis, or permission of the instructor. Must be taken with or following Biological Sciences 431. Laboratory, Wing 106; discussion period, Riley-Robb 105. Preliminary examinations will be held in the evening twice during the semester. Associate Professor Neal and Assistant Professor Fessenden.

Laboratory practice with biochemical substances and experiments designed to illustrate reactions which may occur in biological systems.

[BIOCHEMISTRY OF THE VITAMINS]

(Biological Sciences 530)

Spring. Credit two hours. Offered in alternate years. Prerequisites, Chemistry 353-355 and Biological Sciences 431 or their equivalents. Savage 100. Professor Daniel.*†

The chemical and biochemical aspects of the vitamins. Not offered in 1969.

GENERAL BIOCHEMISTRY, LECTURES

(Biological Sciences 531-532)

Fall and spring. Credit four hours a term. Prerequisite, Chemistry 358 and physical chemistry or permission of instructor. Riley-Robb 125.

An integrated treatment of the fundamentals of biochemistry. Fall term: Proteins, enzymes and the nature of enzymatic catalysis; carbohydrate metabolism; and energetics. Assistant Professor Calvo and staff. Spring term: Nitrogen metabolism; lipid metabolism; and biosynthesis of macromolecules. Assistant Professor Guillory and staff.

GENERAL BIOCHEMISTRY, LABORATORY

(Biological Sciences 533)

Fall. Credit three hours. Prerequisites, Chemistry 358 and Chemistry 388 or 390. Must be taken with or following Biological Sciences 531. Laboratory, Wing 107. One discussion period to be arranged. Professor Nelson and Assistant Professors McCarty and Wharton.

Selected experiments on carbohydrates, lipids, proteins, amino acids, nucleic acids and metabolism (cellular particulates, kinetics, general enzymology) will be given to illustrate basic biochemical principles. The course will emphasize the quantitative aspects rather than qualitative identifications.

FOOD BIOCHEMISTRY

(Food Science 410)

Spring. Credit three hours. Prerequisite, Biological Sciences 431. Riley-Robb 105. Professor to be appointed.

A discussion of some of the important nonmicrobial changes in foods, such as denaturation and the Maillard browning reaction. Emphasis is placed on the occurrence, significance, and prevention or control of the changes as they affect the color, odor, flavor, texture, or nutritive value of foods.

Seminars**RESEARCH SEMINAR IN BIOCHEMISTRY**

(Biological Sciences 631-632)

Fall and spring. Credit one hour per term. Savage 100. Professor Racker.

Required of all graduate students majoring in biochemistry. The course may be repeated for credit.

GRADUATE SEMINAR IN BIOCHEMISTRY

(Biological Sciences 633)

Fall. Credit one hour. Prerequisites, Biological Sciences 531 and 532. Hours to be arranged. Savage 130.

(a) Assistant Professors Fessenden and Guillory: bioenergetics.

(b) Associate Professor McCormick: mechanism of enzyme action.

GRADUATE SEMINAR IN BIOCHEMISTRY

(Biological Sciences 634)

Spring. Credit one hour. Prerequisites, Biological Sciences 531 and 532. Hours to be arranged. Savage 130.

- (a) Associate Professor Wu: control mechanism.
- (b) Assistant Professor McCarty: photosynthesis.

BIOCHEMISTRY SEMINAR

(Biological Sciences 639)

Fall and spring. No credit. Riley-Robb 125. Staff.

Lectures on current research in biochemistry presented by distinguished visitors and staff.

NUTRITION SEMINAR

(School of Nutrition 292)

Spring. Credit one hour. Registration by permission. Savage 100. Professor R. H. Barnes and faculty.

[FOOD BIOCHEMISTRY SEMINAR]

(School of Nutrition 294)

Fall. Credit one hour. Registration by permission. Savage 130. Professor R. H. Barnes, Associate Professor Shallenberger, and staff members from the Department of Food Science and Technology, New York State Agricultural Experiment Station, Geneva, New York.

Assignments and discussions of literature pertaining to the biochemical aspects of foods and food processing. Not offered in 1968.

ADVANCED BIOCHEMICAL METHODS, LABORATORY

(Biological Sciences 536A)

Spring. Credit two hours. Prerequisite, Biological Sciences 533. Graduate majors in biochemistry only. Hours to be arranged. Assistant Professor Keller and Associate Professor Wu.

Research techniques in biochemistry and molecular biology.

ADVANCED BIOCHEMICAL RESEARCH

(Biological Sciences 536B)

Spring. Credit two hours. Prerequisite, Biological Sciences 536A. Graduate majors in biochemistry only. Hours to be arranged. Professor Racker and staff.

Research work in the laboratory of staff members on a rotating basis.

ADVANCED BIOCHEMISTRY, LECTURES

(Biological Chemistry 537)

Fall. Credit one to three hours. Students may take one or more sections of the course, as each section can be taken without attending a preceding section. Prerequisites, Biological Sciences 531 and 532 or permission of instructor. Savage 100

- (a) Professor L. D. Wright: mechanism of coenzyme function;
9 lectures and reading assignments for term paper.
- (b) Professor D. B. Zilversmit: biochemistry of membranes;
9 lectures and reading assignments for term paper.
- (c) Professor Q. H. Gibson: mechanism of enzyme action;
9 lectures and reading assignments for term paper.

ADVANCED BIOCHEMISTRY, LECTURES

(Biological Sciences 538)

Spring. Credit one to three hours. Students may take one or more sections

of the course, as each section can be taken without attending a preceding section. Prerequisites, Biological Sciences 531 and 532 or permission of instructor. Savage 100.

- (a) Professor L. Heppel: nucleic acids; 9 lectures and reading assignments for term paper.
- (b) Assistant Professor D. Wilson: protein synthesis; 9 lectures and reading assignments for term paper.
- (c) Assistant Professor S. Edelstein: structure and function of proteins; 9 lectures and reading assignments for term paper.

[NUTRITIONAL BIOCHEMISTRY]

(School of Nutrition 160)

Spring. Credit three hours. Prerequisites, Biological Sciences 431 or the equivalent and a beginning course in nutrition, e.g., Animal Science 410, Poultry Science 310, or Food and Nutrition 332. Lectures, Savage 100. Professors R. H. Barnes and Wright and Associate Professors Gaylor and McCormick.*

The biological bases of processes related to nutrition in the intact animal are discussed. Emphasis is placed on the integration of physiological and biochemical mechanisms in digestion, absorption, transport, and metabolism and include comparative aspects of the normal and pathologic states. Not offered in 1968.

CHEMISTRY AND PHYSICS

INTRODUCTORY PHYSICAL CHEMISTRY

(Chemistry 285-286)

Throughout the year. Credit five hours a term. Prerequisites, Chemistry 108 or 116, Mathematics 192, Physics 123, or consent of instructor. For students in engineering. Not open to Arts and Sciences students. Professor Widom, Assistant Professor Lind, and assistants.

The lectures will give a systematic treatment of the fundamental principles of physical chemistry. The laboratory will deal with the experimental aspects of the subject and also develop the needed skills in quantitative chemical analysis.

INTRODUCTORY PHYSICAL CHEMISTRY

(Chemistry 387-388)

Throughout the year. Credit five hours a term. Prerequisite, Chemistry 108, or 116, or 205, or Advanced Placement in Chemistry. Chemistry 357 is prerequisite to Chemistry 358. Required of candidates for the degree of B.Ch.E. and A.B. with a major in chemistry. Enrollment limited. Professor Blomquist, Assistant Professor Goldstein and assistants.

A systematic study of the more important classes of carbon compounds, reactions of their functional groups, methods of synthesis, relations and uses. Laboratory experiments will be carried out on the preparation of typical organic compounds, their properties, reactions, and relations.

CHEMISTRY OF NATURAL PRODUCTS

(Chemistry 574)

Spring. Credit three hours. Prerequisites, Chemistry 456 or 457, and 465-466. Primarily for graduate students. Professor Meinwald.

Particular attention will be devoted to methods of structure determina-

tion and synthesis as applied to selected terpenes, steroids, alkaloids, and antibiotics.

PHYSICAL CHEMISTRY OF PROTEINS

(Chemistry 586)

Spring. Credit four hours. Prerequisite, Chemistry 286 or 388. Primarily for graduate students. Professor Scheraga.

Chemical constitution, molecular weight, and structural basis of proteins; thermodynamic, hydrodynamic, optical, and electrical properties; protein and enzyme reactions.

PHYSICS FOR STUDENTS OF BIOLOGY

(Physics 200)

Fall. Credit three hours. Prerequisites, Physics 102 or 108, six credit hours in college chemistry, and six in biological sciences. Students offering Physics 101-102 with an average grade below C must obtain permission of the instructor. Individual conferences to be arranged. Professor L. L. Barnes.

Selected topics related to the study of biology are chosen from properties of matter, electricity, electromagnetic radiation, and nuclear physics. One term paper required.

Professor Call, the School's food economist, explains a problem of supply and population.



GENERAL PHYSICS

(Physics 101-102)

Throughout the year. Credit four hours a term. Prerequisite, three years of college preparatory mathematics or permission of the instructor. Physics 101 is prerequisite to 102. Similar to but less analytically demanding than Physics 207-208. Most students majoring in a natural science who have had or are coregistered in calculus should elect Physics 207-208 instead of this course.

Basic principles and their relation to other physical sciences. Topics include motion, dynamics, conservation laws, kinetic theory, gravitational and electromagnetic forces and fields, wave motion and light, relativity, atomic physics, structure of matter, and nuclear physics. Historical and philosophical allusions as time permits.

ECONOMICS**FOOD ECONOMICS**

(School of Nutrition 159)

Spring. Credit three hours. Savage 100. Associate Professor Call.†

Designed for students who are interested in any aspect of the food industry. Emphasis is placed on the economics of food production, processing, marketing, and consumption. Attention is given to both United States and international food problems in a systematic treatment of economic principles applicable to the food sector of any economy.

MARKETING

(Agricultural Economics 240)

Fall or spring. Credit three hours. Warren 45. Professor Darrah.

A study of how food products are marketed. Special attention is given to the consumption of food products, factors that affect consumption, market channels, operation of different marketing agencies, storage, transportation, packaging, product identification, advertising and promotion, buying, selling, and costs.

[SEMINAR IN WORLD PROBLEMS OF FOOD AND POPULATION]

(School of Nutrition 250)

Spring. Credit two hours. Open only to graduate students. Registration by permission. Savage 130. Professor van Veen and Associate Professor Call.†

Demographic behavior, population and food supply, and comparative agriculture. Not offered in 1968.

SURVEY OF INDUSTRIAL AND LABOR RELATIONS

(Industrial and Labor Relations 250)

Fall and spring. Credit three hours. Ives Hall. Professor Doherty or Professor MacIntyre.

A survey for students in other divisions of the University. An analysis of the major problems in industrial and labor relations: labor union history, organization, and operation; labor market analysis and employment practices; industrial and labor legislation, and social security; personnel management and human relations in industry; collective bargaining; mediation and arbitration; the rights and responsibilities of employers and employees; the major governmental agencies concerned with industrial and labor relations.

40 FOOD SCIENCE

ADVANCED ORGANIZATION AND MANAGEMENT

(Institution Management 425)

Spring. Credit two hours. Prerequisite, Institutional Management 419. Assistant Professor Breunig.

Principles of organization and management of the food service department, analysis and interpretation of major administrative problems, and the application of business management techniques and methods of control to the operation of the food service department will be stressed. A one-day field trip to typical organizations is planned. Estimated cost, \$4.00.

ECONOMICS OF AGRICULTURAL DEVELOPMENT

(Agricultural Economics 364)

Spring. Credit three hours. Prerequisite, Course 150, Economics 103-104, or consent of the instructor. Warren 345. Professor Mellor.

A discussion of the special problems of agricultural development in low per capita income areas and countries. Attention will be devoted to the relationship between development in agriculture and in other sectors of the economy, capital and capital formation, the role of land and land reform, increasing efficiency in resource use, coordination problems in agricultural development, and the like.

FOOD SCIENCE

DAIRY AND FOOD ENGINEERING

(Food Science 302)

Fall. Credit four hours. Offered in alternate years. Prerequisites, Physics 101 and 102 or the equivalent and Food Science 100. Stocking 119. Professor Jordan.†

Engineering aspects of dairy and food plant operations.

CONCENTRATION AND FREEZING PROCESSES

(Food Science 311)

Spring. Credit four hours. Offered in alternate years. Stocking 120. Professor Jordan and Associate Professor Potter.

The principles and practice of condensing, drying and freezing food products.

STERILIZATION PROCESSES

(Food Science 313)

Spring. Credit three hours. Offered in alternate years. Prerequisites, Chemistry 353 or equivalent, Biological Sciences 394, and Physics 102. Recommended, a course in calculus and a course in biochemistry. Lectures, Riley-Robb 225; laboratory, Riley-Robb 44. Professor Buck.†

The principles of food preservation and the fundamentals of food processing from raw materials to finished product. Heat transfer, unit operations and unit processes employed by the canning industry will be emphasized, but sterilization by any means such as heat, chemicals, physical destruction, and filtration will be demonstrated. The effects of lethal energy treatment of biological fluids and systems on desirable components such as nutritive factors and flavor components will be considered along with the cost of operation. The laboratory involves actual participation in plant operations in the processing and preservation of various food products, and field trips.

FOOD FROM FERMENTATIONS

(Food Science 401)

Fall. Credit five hours. Offered in alternate years. Prerequisites, Food Science 100, 210, dairy and food microbiology and organic chemistry or biochemistry. Professor Kosikowski and Assistant Professor Ledford.†

The chemistry, microbiology, and technology of fermentations leading to important foods. Emphasis is placed on milk and cheese fermentations but consideration is given to fermentations resulting in major foods from all plant and animal sources. Line-flow processing and testing practices designed to acquaint the student with principles are carried out in laboratory.

CHEMISTRY OF MILK

(Food Science 404)

Fall. Credit three hours. Offered in alternate years. Prerequisites, qualitative and quantitative analysis and organic chemistry. Stocking 120. Assistant Professor Ledford.†

A study of milk constituents and physical properties. Deals with milk enzymes, lactose, milk fat, milk proteins, and minor constituents.

FOOD BIOCHEMISTRY

(Food Science 410)

Spring. Credit three hours. Prerequisite, Biological Sciences 431. Riley-Robb 105. Professor to be appointed.†

A discussion of some of the important non-microbial changes in foods, such as denaturation and the Maillard browning reaction. Emphasis is placed on the occurrence, significance, and prevention or control of the changes as they affect the color, odor, flavor, texture, or nutritive value of foods.

ANALYTICAL METHODS

(Food Science 413)

Spring. Credit four hours. Offered in alternate years. Prerequisites, Food Science 210, one term of either organic chemistry or biochemistry. Lectures, Stocking 119; laboratory, Stocking 209. Assistant Professor Sherbon.†

A study of the analytical methods important to the food industry. The emphasis is on understanding the basic analytical chemistry applied in the various tests. General topics include sampling, gravimetric and volumetric methods, optical methods, electrochemistry, and the use of basic statistics.

SCIENCE OF FOOD

(Food and Nutrition 446)

Fall. Credit three hours (lectures only) or four hours. Prerequisites, Food and Nutrition 246, and a college course in organic chemistry or biochemistry. Students who have had limited laboratory experience in comparative foods should register for four hours. Lectures, Van Rensselaer 339. For students registered for four credit hours, laboratory, Van Rensselaer 358. Professor Hester and Associate Professor Armbruster.†

Scientific principles underlying modern food theory and practice. The relation to food quality and to recommended methods of food preparation of (a) the physical and chemical properties of proteins, fats, starches, sugars, leavening agents, and pigments; (b) the properties of true solutions and principles of crystallization; (c) colloidal systems—gels, sols, foams, and emulsions. Laboratory experiments designed to illustrate the effect of varying ingredients and preparation procedures on the quality of food products.

BIOCHEMISTRY-PHYSIOLOGY

Plant Physiology

FOOD CHEMISTRY

Analytical Microbiology

PAPER CHROMATOGRAPHY

Microbiology

Microbiology

FOODS, FOOD TECHNOLOGY,
FOOD CONTROL-MICROBIOLOGY

FOOD IN NUTRITION

FOOD IN NUTRITION

AGRICULTURE, AGRICULTURAL
ECONOMICS-ECONOMICS



SCIENCE OF FOOD, LABORATORY

(Food and Nutrition 447)

Fall. Credit one hour. Prerequisite or parallel, Food and Nutrition 446. Van Rensselaer 358. Associate Professor Armbruster.†

Laboratory experiments designed to illustrate the physiochemical behavior of colloidal and crystalline systems and chemical reactions of the food components.

EXPERIMENTAL FOOD METHODS

(Food and Nutrition 456)

Spring. Credit three hours. Prerequisite, Food and Nutrition 446. A course in statistics and Food and Nutrition 447 are desirable but not required. Laboratory, Van Rensselaer 358. Associate Professor Armbruster.†

Application of the scientific method in the design and performance of experimental food problems and in the interpretation and evaluation of results. Independent laboratory problems.

SPECIAL PROBLEMS FOR GRADUATE STUDENTS

(Food and Nutrition 500)

Fall and spring. Credit to be arranged. Department faculty.†

For students recommended by their chairmen and approved by the instructor in charge for independent, advanced work.

READINGS IN FOOD

(Food and Nutrition 516)

Fall. Credit two hours. Prerequisite, Food and Nutrition 446 or equivalent. Van Rensselaer 301. Department faculty.†

Critical review of selected topics in the current literature. Emphasis on experimental data basic to the scientific principles underlying modern theory and practice in food preparation.

SEMINAR IN FOOD

(Food and Nutrition 606)

Spring. Credit one hour. Van Rensselaer 339. Professor Hester and department faculty.

SANITARY ASPECTS OF MENU ITEM PREPARATION IN QUANTITY

(Institution Management 529)

Spring. Credit two hours. Graduate section of Institution Management 329. Instructor's signature required for preregistration. Additional conferences to be arranged. Van Rensselaer 3-M-11.

Topics will include sources of food contamination, holding conditions as they affect bacterial multiplication, and principles of sanitary handling and holding of ingredients and menu items, as they apply to hospital and school food services. Emphasis will be placed on the presentation of recent research data.

POULTRY MEAT AND EGG TECHNOLOGY

(Poultry Science 450)

Spring. Credit three hours. Given in alternate years. Prerequisites, Chemistry 303, or its equivalent, and Biological Sciences 290. Professor Baker.†

A discussion and study of some of the important microbial and nonmicrobial changes in poultry meat and eggs as well as the chemical composition and preservation of these products. Development of new products is also emphasized.

44 MATHEMATICS

POSTHARVEST PHYSIOLOGY, HANDLING, AND STORAGE OF FRUITS

(Pomology 201)

Fall. Credit three hours. Prerequisite, Pomology 101 or 102. Lectures, Plant Science 143; laboratory, Plant Science 107. Professor Blanpied.†

The chemistry and physiology of fruits as they affect quality and marketability are studied. Handling methods, maturity indices, and storage practices are considered. Practical work involves grading and inspection of fruits and storage of fruit in different ways. One Saturday field trip is required.

VEGETABLE CROPS PHYSIOLOGY

(Vegetable Crops 401)

Fall. Credit four hours. Prerequisites, Vegetable Crops 211 and Biological Sciences 240 or their equivalent. Lectures, East Roberts 222, and laboratory.

The physiological bases of cultural practice and the application of these principles to problems in vegetable production. Original literature is used to illustrate the principles involved. Experimental material is studied in the laboratory to amplify lecture topics. Subjects discussed include: mineral nutrition as influenced by fertilization programs and crop sequence; nutrient interactions and induced deficiencies; growth and development; flowering; fruit setting; growth correlation; senescence; sex expression; photoperiodism; vernalization; and environmental factors affecting growth.

HANDLING AND MARKETING VEGETABLES, ADVANCED COURSE

(Vegetable Crops 412)

Fall. Credit four hours. Lectures, East Roberts 222; laboratory, East Roberts 223. One-hour conference to be arranged. Professor Hartman.†

(Students registered for the Tuesday laboratory are scheduled to go on a field trip at 9:00 a.m., on Wednesday, the day on which classes officially begin.)

Has the same lecture, laboratories, and field trips as Vegetable Crops 212. Much more outside reading of research and trade publications in the area covered is required in Vegetable Crops 412 than in Vegetable Crops 212, and different examinations are given for the two courses.

RESEARCH METHODS IN VEGETABLE CROPS

(Vegetable Crops 501)

Spring. Credit three hours. Offered in alternate years. Prerequisite, Vegetable Crops 401. It is recommended that Plant Breeding 510 and 511 precede or accompany this course. East Roberts 223. Professor Kelly.

A study of research techniques peculiar to vegetable crops.

MATHEMATICS

CALCULUS

(Mathematics 111)

Either term. Credit three hours.

Plane analytic geometry, differentiation and integration of algebraic and trigonometric functions, applications. In the fall term, the third lecture each week will be of special character, devoted to a more rigorous approach to the calculus.

CALCULUS

(Mathematics 112)

Either term. Credit three hours. Prerequisite, Mathematics 111.

Differentiation and integration of elementary transcendental functions, the technique of integration, conic sections, polar coordinates, infinite series.

STATISTICAL METHODS I

(Statistics and Biometry 510)

Fall. Credit three hours. Prerequisite, graduate standing or permission of instructor. Warren 345. Assistant Professor Urquhart.

The distributions of statistics encountered in biological and other fields are considered from the point of view of elementary probability notions and by sampling from known populations. The results, with principles of experimentation, are applied to the conducting of experiments and interpretation of results. The nature and validity of experimental error are treated. Topics include point and interval estimation, tests of hypotheses, the simpler experimental designs and their analyses of variance, linear regression, correlation, and methods involving rank order and rank sum procedures.

STATISTICAL METHODS II

(Statistics and Biometry 511)

Spring. Credit three hours. Prerequisite, Statistics and Biometry 510 or the equivalent. Warren 345. Assistant Professor Urquhart.

The work of Statistics and Biometry 510 is continued. Topics include factorial experiments, individual degrees of freedom, analysis of covariance, analysis of variance of two-way classifications with disproportionate numbers, multiple and curvilinear regression, curve fitting, the treatment of discrete data, and some recent developments in statistics.

ECONOMIC AND SOCIAL STATISTICS

(Industrial and Labor Relations 510)

Fall and spring. Credit three hours. Professor McCarthy.

A non-mathematical course for graduate students in the social studies without previous training in statistical method. Emphasis will be placed

Research associate conducting a metabolism experiment with white rats.



on discussion of technical aspects of statistical analysis and on initiative in selecting and applying statistical methods to research problems. The subjects ordinarily covered will include analysis of frequency distributions, time series (including index numbers), regression and correlation analysis, and selected topics from the area of statistical inference.

MICROBIOLOGY

GENERAL MICROBIOLOGY

(Biological Sciences 290)

Either term. Credit five hours. Prerequisites, Biological Sciences 101-102 or 103-104 and Chemistry 104 or 108 or the equivalent. Lectures, Stocking 218. Laboratory, Stocking 301; spring term M W section in Stocking 321. Professors Seeley (fall) and VanDemark (spring).

An introductory course; a study of the basic principles and relationships in the field of microbiology, with fundamentals necessary to further work in the subject. The course offering in the spring term will provide special emphasis on the application of microbiology in home economics and agriculture.

GENERAL MICROBIOLOGY, LECTURES

(Biological Sciences 290A)

Either term. Credit three hours. Prerequisites, Biological Sciences 101-102 or 103-104 and Chemistry 104 or 108 or the equivalent. Stocking 218. Professors Seeley (fall) and VanDemark (spring).

The same as the lecture part of Biological Sciences 290. Will not serve alone as a prerequisite for advanced microbiology courses.

GENERAL MICROBIOLOGY, LABORATORY

(Biological Sciences 290B)

Either term. Credit two hours. Professors Seeley (fall) and VanDemark (spring).

The same as the laboratory part of Biological Sciences 290. May be taken only by special permission of the instructor.

ADVANCED BACTERIOLOGY, LECTURES

(Biological Sciences 390)

Spring. Credit four hours. Prerequisites, Biological Sciences 290 and organic chemistry and permission of instructor. Lectures, Stocking 119; laboratory, Stocking 321. Professor MacDonald.

A study of the comparative physiological and ecological relationships among bacteria and some related organisms. A number of groups of bacteria will be discussed in detail as well as factors which influence their ability to survive in nature. In addition, a number of lectures will be devoted to the history of bacteriology and to the theory and development of bacterial classification.

APPLIED AND INDUSTRIAL MICROBIOLOGY

(Biological Sciences 393)

Fall. Credit three hours. Given in alternate years. Prerequisites, Biological Sciences 290 or the equivalent. Stocking 119. Professors Delwiche, Seeley, and VanDemark.

A survey of the microbiology of industrial fermentations, water, and waste decomposition.

DAIRY AND FOOD MICROBIOLOGY

(Biological Sciences 394)

Spring. Credit four hours. Prerequisite, Biological Sciences 290. Lectures, Stocking 119; laboratory, Stocking 301. Professor Naylor.

The major families of microorganisms of importance in dairy and food science are studied systematically with emphasis on the role played by these organisms in food preservation, food fermentations, and public health. The laboratory work includes practice in the use of general and special methods for microbiological testing and control of dairy and food products as well as practice in the isolation and characterization of organisms found in foods.

MICROBIAL PHYSIOLOGY LECTURE

(Biological Sciences 490A)

Spring. Credit three hours. Prerequisites, Microbiology 390 or permission of instructor. Lectures, T Th S 10:10. Primarily for microbiology majors intending to enter graduate school and for graduate students. Mrs. Gibson and staff.

A study of the organization of physiological processes in microorganisms, including a study of structure, energy-yielding mechanisms, macromolecular biosynthesis and of growth and regulation.

MICROBIAL PHYSIOLOGY LABORATORY

(Biological Sciences 490B)

Spring. Credit three hours. Prerequisites, a grade of B minus or better in Microbiology 390, coregistration in 490A, and permission of the instructor. Time to be arranged. Prof. A. J. Gibson and staff.

Experiments on material covered in Course 490 lectures will be used to introduce students to modern techniques used in physiological research, such as the use of radioisotopes, large-scale growth of microorganisms, and the isolation and characterization of specific cellular components.

MICROBIAL GENETICS

(Biological Sciences 495)

Fall. Credit four hours. Prerequisites, Biological Sciences 281 and 290 or permission of the instructor. For upperclassmen and graduate students. Lecture, W 7:30-9:25 p.m. Laboratory, T 1:25-4:25 and other hours to be arranged. Mr. Zahler.

Genetics of bacteria and their viruses, with emphasis on the mechanisms of genetic phenomena.

MICROBIAL GENETICS LECTURES

(Biological Sciences 495A)

Fall. Credit two hours. Prerequisites, Biological Sciences 281 and 290 or 290A. For upperclassmen and graduate students. Lecture, W 7:30-9:25 p.m. Prof. Zahler.

The course is the same as the lecture portion of Biological Sciences 495. S and U grading optional.

CHEMISTRY OF MICROBIAL PROCESSES

(Biological Sciences 496)

Spring. Credit two hours. Prerequisites, beginning courses in general microbiology, biochemistry, and organic chemistry. This course is intended for upperclassmen and graduate students. Stocking 119. Professor Delwiche.

Selected topics pertaining to the energy metabolism, oxidative and fermentative abilities, and biosynthetic capacities of microorganisms. Where possible and appropriate the subject matter deals with the various microbial forms in a comparative sense.

PATHOLOGY

PATHOLOGY OF NUTRITIONAL DISEASES

(Veterinary Pathology 931)

Spring. Credit three hours. Lecture and laboratory. Designed primarily for graduate students of nutrition. Prerequisites, Pathology 630 and 631. Professor Krook.*

PHYSICAL BIOLOGY

RADIOISOTOPES IN BIOLOGICAL RESEARCH: PRINCIPLES AND PRACTICE

(Veterinary Physical Biology 921)

Spring. Credit four hours. Lectures and laboratory. Prerequisites, a course in quantitative chemistry and permission of instructor. Professor Comar and staff.

Lectures, demonstrations, and laboratory on the fundamentals of atomic energy procedures and applications to biological research.

BIOLOGICAL EFFECTS OF RADIATION

(Veterinary Physical Biology 922)

Fall. Credit three hours. Lectures and laboratory. Assistant Professor Casarett.

Lectures and demonstrations on radiation physics, radiation chemistry, radiation effects at the cellular level, radiation effects in multicellular organisms, genetic effects of radiation, and radioprotective and radiomimetic substances.

BIOLOGICAL MEMBRANES AND NUTRIENT TRANSFER

(Veterinary Physical Biology 923)

Spring. Credit two hours. Prerequisites, animal or plant physiology, quantitative and organic chemistry, physics, and consent of instructor. Cellular physiology and elementary physical chemistry desirable. Professor Wasserman.

An introduction to elementary biophysical properties of biological membranes, theoretical aspects of permeability and transport, and mechanism of transfer of inorganic and organic substances across intestine, placenta, kidney, erythrocytes, bacteria, and other biological systems.

PHYSIOLOGY

HISTOLOGY: THE BIOLOGY OF THE TISSUES

(Biological Sciences 313)

Fall. Credit four hours. Prerequisites, a two-semester introductory biology sequence; comparative anatomy and organic chemistry or biochemistry desirable. Lectures, Stimson G1; laboratory, Stimson 206. Professor Wimsatt.

A general course dealing with the biology of the tissues to provide the student with a basis for understanding the microscopic and fine structural organization of vertebrates and the methods of analytic morphology at the cell and tissue levels. The dynamic interrelations of structure, chemical composition, and function in cells and tissues are stressed.

SPECIAL HISTOLOGY: THE BIOLOGY OF THE ORGANS

(Biological Sciences 412)

Spring. Credit four hours. Given in alternate years. Prerequisites, Biological Sciences 313, or consent of instructor. Enrollment limited to 18 students. Lectures, Stimson 105; laboratory, Stimson 206. Professor Wimsatt.

A continuation of Biological Sciences 313. The microscopic and ultrastructural organization of the principal vertebrate organ systems are studied in relation to their development, functional interaction, and special physiological roles. Biological Sciences 313 and 412 together present the fundamental aspects of the microscopic and submicroscopic organization of the vertebrate body from a physiological perspective. The organization of the course involves student participation in "lecture-seminars," and the prosecution of independent project work supplementary to the regular work of the laboratory. The latter enables students to gain practical experience with histological and histochemical preparative techniques.

GENERAL ANIMAL PHYSIOLOGY, LECTURES

(Biological Sciences 413)

Fall. Credit three hours. Prerequisites, one year of biology and courses in chemistry; organic chemistry and biochemistry desirable. Stimson G25. Associate Professor McFarland and Associate Professor Salpeter.

The principles of animal physiology are developed through consideration of the functioning of cells, tissues, and organs. Special topics discussed include respiration, metabolism, circulation, excretion, chemical integration, muscle contraction, nerve action, and sensory reception.

GENERAL ANIMAL PHYSIOLOGY, LABORATORY

(Biological Sciences 413A)

Fall. Credit one hour. Prerequisites, Biological Sciences 413 or equivalent must be taken concurrently. Stimson G25; laboratory, Stimson 306. Associate Professor McFarland.

Students are introduced to basic techniques utilized in the study of the physiology of animal tissues. Experiments cover topics dealing with respiration, properties of muscle, circulation, activity of nerves, and osmotic phenomena.

MAMMALIAN PHYSIOLOGY

(Biological Sciences 414)

Spring. Credit six hours. Registration by permission. Prerequisite, a year of biological sciences. Courses in biochemistry, histology, and gross anatomy desirable. Lectures, Morrison 167; laboratory, Morrison 174. Professor Visek (in charge), Professors Gasteiger, Gibson and Hansel.

A general course in mammalian physiology including circulation, respiration, digestion, metabolism, renal function, endocrinology, and the nervous system.

[CELLULAR PHYSIOLOGY, LECTURES]

(Biological Sciences 511)

Fall. Credit three hours. Prerequisites, previous courses in animal or plant physiology and biochemistry desirable. Stimson G1.

An introduction to basic aspects of animal cell function including structural and functional organization of cells, permeability and active transport, transcellular secretion, ionic mechanisms underlying excitability phenomena in neurons and receptor cells, contractility, and bioluminescence. Not offered in 1968.

50 SOCIAL STUDIES

[CELLULAR PHYSIOLOGY, LABORATORY]

(Biological Sciences 511A)

Fall. Credit two hours. Prerequisite, consent of the instructor. Enrollment is limited. Stimson 306.

The laboratory emphasizes a number of biophysical approaches to cellular activities. Not offered in 1968.

EXPERIMENTAL ENDOCRINOLOGY

(Biological Sciences 513)

Fall. Credit two or three hours. Prerequisites, a year of zoology or its equivalent, organic chemistry, physiology, and consent of instructor. Primarily for graduate students, open to undergraduates for two credits. Lectures, Stimson G1; laboratory, Stimson 306. Professor Leonard.

Lectures on the anatomy and physiology of the vertebrate endocrine glands, glandular interrelationships, mechanism of hormone action, chemical and physiological properties of the hormones, assay methods. Laboratory includes small animal surgery, micro techniques for the endocrines, illustrative experiments on the effects of hormones.

FUNDAMENTALS OF ENDOCRINOLOGY

(Animal Science 427)

Fall. Credit four hours. Prerequisite, a course in human or veterinary physiology or by permission. Morrison 167. Professor Hansel.

A general course in the physiology of the endocrine glands, and the roles played by each hormone in the regulation of normal body processes.

The laboratory work consists of a series of projects designed to illustrate the basic principles of endocrinology and their applications to more efficient production in all classes of livestock.

PHYSIOLOGY

(Veterinary Physiology 511)

Spring. Credit three hours. Prerequisites, Physiology 510, Anatomy 501 and 502, or Anatomy 900 or Biological Sciences 311 and 433. Professors Bergman, Sellers, Stevens; Associate Professors Dobson and Nangeroni.

Lectures and demonstrations on cellular physiology, muscle, nervous system, digestive system, urine secretion, blood and lymph.

PHYSIOLOGY

(Veterinary Physiology 610)

Fall. Credit three hours. Prerequisite, Physiology 511. Professors Bergman and Sellers.

Lectures and demonstrations on blood, lymph, circulation, respiration, endocrine organs, and reproduction.

SOCIAL STUDIES

THE SOCIOLOGY OF WORK

(Rural Sociology 324)

Fall. Credit three hours. Not open to freshmen or sophomores. Prerequisite, Rural Sociology 100 or equivalent. Lectures and discussions, Warren 232. Professor Taietz.

The following topics are covered: (1) the function of work for society and the individual, (2) bureaucratic structure and specialization, (3) the development of occupational norms and identifications, (4) occupational status, (5) the process of occupational selection, (6) dynamics of occupational change—horizontal and vertical mobility, (7) a case study of an occupation; trends in the professionalization of social work.

COMMUNITY AND REGIONAL DEVELOPMENT AND PLANNED CHANGE

(Rural Sociology 411)

Spring. Credit three hours. Prerequisite, Rural Sociology 100 or 210 or permission of instructor. Warren 37. Associate Professor Reeder.

A consideration of the problems involved in helping people and organizations in a community work together to meet their common needs. There are two major emphases: (1) analysis of communities from the perspective of the community development worker as a change agent, (2) consideration of the problems which confront community development workers and the processes and methods by which they carry out their various community development tasks. Projects in nearby communities provide field laboratory experiences.

LATIN AMERICAN SOCIETIES IN TRANSITION

(Rural Sociology 414)

Spring. Credit three hours. Prerequisite, introductory course in sociology. Lectures, Warren 131; discussion, Warren 31. Associate Professor Ellenbogen.

The unit of analysis is the community. Emphasis is given to identifying a variety of "types" of rural communities in Latin America. Focus is on the changes occurring in population, technology, and organizational structure. Activities such as production-consumption, social control, socialization, etc., are analyzed. Consideration is also given to the linkages between "types" of rural communities and national and international associations. Other precipitants of social change, both "external" and "internal" to the rural community, are taken into account.

RESEARCH DESIGN

(Rural Sociology 515)

Fall. Credit three hours. Open to graduate students only. Warren 232. Associate Professor Harp.

An introduction to the methods of social research. Course topics follow the major steps in the design and execution of sociological research from the definition of the problem and formulation of hypotheses to the interpretation of results and preparation of a final report. Practice exercises are assigned each week utilizing data from departmental projects.

CROSS-CULTURAL RESEARCH METHODS

(Rural Sociology 516)

Spring. Credit three hours. Prerequisite, Rural Sociology 515 or permission of the instructor. Warren 345. Associate Professor F. W. Young.

Problems of adaptive methods to other cultural settings as well as the use of specifically cross-cultural procedures. Discussion of modifications of surveys, key informant interviews, observation techniques, photography, case studies, and the exploitation of census and other available data. Special attention to comparisons based on the data of the Human Relations Area files. Consideration of designs, units of analysis, variables, and hypotheses relevant to problems of less developed countries.

APPLICATIONS OF SOCIOLOGY TO DEVELOPMENT PROGRAMS
(Rural Sociology 528)

Spring. Credit three hours. Open to graduate students only. Warren 31. Professor Polson.

Application of sociological theory and methods to the problems of institutions and agencies concerned with rural development. Special emphasis is placed on programs for agricultural extension education and community development in low-income countries.

SOCIAL ANTHROPOLOGY
(Anthropology 301)¹

Fall. Credit four hours. Open to sophomores and upperclassmen who have not had Anthropology 101. Professor Sharp.

A study and comparison of the types of learned, shared, and transmitted behavior patterns and ideas by means of which men of various periods and places have dealt with their environment, worked out their social relations with their fellow men, and defined their place in the cosmos. An inquiry into human nature and its expression in man's institutional and intellectual creations.

CULTURE CHANGE
(Anthropology 313)¹

Fall. Credit four hours.

A study of various theories of cultural change and their relevance to the on-going social process; an analysis of such concepts as innovation, diffusion, and acculturation in relation to culture change theory; a consideration of factors involved in maintaining stability or stimulating change in nonindustrialized culture.

APPLIED ANTHROPOLOGY
(Anthropology 314)¹

Spring. Credit four hours. Professor Opler.

The uses of anthropology in the modern world. Designed not only for students of the humanities and social sciences, but also for natural scientists concerned with the cultural problems involved in technological change, community development, native administration, and modernization in various regions of the world.

COMPARATIVE SOCIAL SYSTEMS
(Anthropology 423)¹

Fall. Credit four hours. Professor Turner.

The topics dealt with will include the comparative study of systems of kinship, politics, religion and magic in preliterate societies and the relationship between these types of systems in particular societies. They will further include age and sex differentiations; age-sets and age-grades; division of labor, types of specialization, occupational associations; rank and occupation; social classes, caste, slavery, pawnship and serfdom; secret associations; social networks and social mobility. References will also be made to theories concerning them.

¹See the *Announcement of the College of Arts and Sciences* for additional offerings in this area.

ETHNOLOGY OF NORTH AMERICA(Anthropology 430)¹

Spring. Credit four hours. Prerequisite, Anthropology 101 or 301, or consent of the instructor. Professor Roberts.

A general survey of the ethnography of North America, with emphasis on problems and topics to which the North American materials are most relevant. Selected cultures will be considered in some detail.

ETHNOLOGY OF MIDDLE AND SOUTH AMERICA(Anthropology 432)¹

Spring. Credit four hours.

A descriptive and analytical survey of contemporary native cultures of Middle and South America in terms of economic, social, political, and religious organizations. Representative groups from all cultural areas are considered, ranging from such marginal peoples as the Tierra del Fuegians to such complex civilizations as the Inca.

ETHNOLOGY OF MAINLAND SOUTHEAST ASIA(Anthropology 434)¹

Spring. Credit four hours. Professor Sharp.

The development and distribution of major cultural systems in mainland Southeast Asia. Discussion of selected groups in southern China, Assam, Burma, Thailand, Laos, Cambodia, and Vietnam, and of the fate of traditional cultural characteristics following the expansion of Chinese, Indian, Moslem, and Western civilizations into these areas.

ETHNOLOGY OF AFRICA(Anthropology 436)¹

Spring. Credit four hours.

A social and cultural survey of representative African peoples. Stress is laid on the comparative study of political institutions and local descent groups. Ritual beliefs and practices are considered in relation to repetitive and radical change.

CULTURE AND SOCIETY IN SOUTH ASIA(Anthropology 441)¹

Fall. Credit four hours. Professor Opler.

A survey of the social, economic, political, and religious institutions of the countries of South Asia. Both the traditional cultures and changes which are taking place are considered.

RESEARCH**SPECIAL PROBLEM**

(School of Nutrition 199)

Report of individual problem under the direction of any member of the faculty of the Graduate School of Nutrition. See page 19 for details.

¹See the *Announcement of the College of Arts and Sciences* for additional offerings in this area.

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- College of Engineering
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- Center for International Studies
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- Graduate School: Biological Sciences
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